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Get JET set

Confusion over Brexit is adding to the anxiety of staff at a crucial UK research site for fusion energy.

Prime Minister Theresa May conceded on 21 May that a post-Brexit Britain was willing to pay to "fully associate" with Euratom, Europe's nuclear agency. The details of the arrangement, similar to many that surround the controversial exit of the United Kingdom from the European Union, still have to be ironed out. And among those watching the negotiations with mounting concern are scientists at the Joint European Torus (JET) near Oxford, UK, who currently benefit greatly from Britain's membership of the agency. The hundreds of researchers at JET receive annual funding of around €60 million (US$70 million), because Britain is part of Euratom. As it stands, that funding will cease at the end of this year.

The JET facility serves as a key testing ground for ITER, the ambitious experimental fusion reactor being constructed in southern France. For the past three years, JET has been preparing a test run using a mixture of two hydrogen isotopes, deuterium and tritium, to mimic ITER's planned eventual fuel mix. The test should give the best indication yet of the likely performance of ITER's particular fusion method — which uses magnetic fields to confine a burning, ionized gas (or plasma) within a doughnut-shaped ring. The run should also help to guide the design of a prototype power plant to follow ITER.

The JET experiment is clearly a crucial project that needs support. But with Brexit looming, where will that support come from?

In theory, the EU can keep paying for JET in the short term. A progress report on the Brexit negotiations, published late last year, says the United Kingdom can continue to pay into and participate in EU funding programmes until December 2020. And Britain has confirmed that it will keep paying its (much smaller) direct share of JET costs until then, too. Moreover, the European Commission (EC) has said that the EU should continue to fund JET; cash for the lab is thought to be included in the EC's draft programme of fusion-research funding in 2019–20.

But there is a snag. Before the EU can publicly confirm any plans to extend JET's contract, a number of legislative hoops need to be jumped through. And the process is dragging. The problem lies in how fusion research is funded. A quirk of history means that Euratom's research funding is allocated in 5-year periods — the current one ending in December 2018 — followed by 2-year top-ups that align the programme with the EU's 7-year research-funding cycles (the latest of which ends in 2020). Although the top-up is a routine process, it requires the EU Council to approve new legislation, and that has yet to happen.

Renewal of JET's contract has gone down to the wire before, but the added uncertainty of Brexit is making staff nervous. It hardly helps that the site is repeatedly highlighted in the UK press as a potential casualty of Brexit, rarely with the caveat that its contract should be secure until the end of 2020. JET's chief executive, Ian Chapman, told *Nature* last year that some top-level staff had already found positions elsewhere. The longer the process drags on, the less attractive JET will seem to researchers.

One wrinkle has already been ironed out: draft text of the EU legislation has been tweaked to allow its fusion programme to include JET, even if the facility sits outside existing funding schemes. But a vote on the proposed regulation has been delayed by a decision to consult the European Parliament — largely a courtesy that has nothing to do with JET. And because the parliament is unlikely to offer an opinion until September, the final sign-off might now not come until December. No legislation means no research programme, which means no JET contract. The result is that staff at the facility might not officially know whether they have a job on 1 January 2019 until just days before — let alone be able to do the important deuterium–tritium run.

"Politicians should act to secure JET's funding."

The facility itself is ploughing ahead with its preparations for the run, under the assumption that it will be funded for the next two years. It has no choice but to do so. The planned experiments are key to understanding how plasma will behave in reality, and nowhere else in the world can do the research before ITER is due to begin. Things will probably work out. But the prime minister's concession regarding Euratom is yet another example of how much her government seems to be making up its Brexit policy as it goes along. Hoping that things will work out is no way to reassure anyone, let alone a basis for strategy. Politicians should act to secure JET's funding for the next two years — and beyond. ■

Racing hearts

Japan must show that a promising therapy for damaged hearts works as claimed.

As we report in a News story this week (page 619), Japan is set to push ahead with a promising treatment for heart disease that relies on stem cells. It could soon be made available under a fast-track approval system that the country put in place in 2014. Designed to speed access to regenerative therapies, the law allows prospective treatments to be marketed and used as long as they have been proved to be safe. Only a suggestion of efficacy is required — with more-convincing data supposed to be gathered retrospectively from patients who have been given the approved treatment.

The system has its critics — *Nature* among them (see *Nature* **528**, 163–164; 2015). The latest move adds further concerns.

The therapy is the work of a physician who was also the first to take advantage of the new law with a related treatment: Osaka University cardiac surgeon Yoshiki Sawa. There is no suggestion that Sawa has not followed the rules, set out by the Pharmaceuticals and Medical Devices Agency. He has. The issue is whether those rules are adequate and appropriate and have the welfare of patients at their heart. They do

not. Treatments of no proven efficacy are being sold to patients (who effectively subsidize the clinical trials to test them). They receive no refund if the therapy is subsequently found not to work. Patients also take risks: they undergo immunosuppression and the surgery itself.

The new study takes induced pluripotent stem cells (iPS cells) that have been banked and characterized to ensure they are safe, and converts them to heart-muscle cells. These are then spread into a thin sheet that is attached to the weakened heart muscle. It is only the second clinical application of iPS cells and is generating excitement around the world. The problem is that the earlier treatment from Sawa — which is ongoing under the fast-track system — has yet to produce convincing results.

In that treatment, approved in September 2015, patients received a sheet of muscle cells made from their own leg tissue, rather than from iPS cells. Called HeartSheet, the muscle sheet is attached to weakened heart muscle that has usually been damaged as a result of a heart attack or plaque build-up and is often the cause of heart failure. The scientists behind the treatment speculate that the muscle cells work by releasing growth factors, not by becoming supporting tissue themselves. Other researchers are sceptical.

Now there are two new treatments being investigated for the same condition, and it's impossible to know yet whether either will work or which might be best for individual patients.

It makes sense that heart-muscle cells (used in the second study) might work better for the heart than leg-muscle cells (used in the first). Indeed, it was reported a decade ago that injecting muscle cells from the leg did not improve heart function (P. Menasché *et al. Circulation* **17,** 1189–1200; 2008).

Most physicians hoping to treat heart disease by way of regenerative medicine have moved on to other strategies, with many looking to heart-muscle cells. That doesn't mean HeartSheet cannot work, but it does raise the question of whether patients who are given it will benefit.

Sawa himself has raised the issue. At a symposium last month touting the new iPS cell trial, he said "leg cells are not good, well, at least not enough". And the Osaka University web page announcing the iPS cell trial says that HeartSheet was found to be ineffective for more serious cases. Sawa told *Nature* that the cells work in some cases, but that he expects the new iPS cell therapy to be more effective.

"Treatments of no proven efficacy are being sold to patients."

All this places a question mark over how the efficacy of HeartSheet can be proved as required. Half way through its scheduled 5-year plan, fewer than 10 patients — of the 60 required by the terms of its approval — have received the treatment. If the trial doesn't make 60, the health ministry told *Nature,* there would either be an extension or the ministry would try to make a decision on the basis of the available data.

Some physicians have called for the HeartSheet tests to end and the data to be assessed before the new iPS cell study can begin. That might be an over-reaction, but pressure on the Japanese government is increasing. The government needs to move quickly to make sure that evaluation of the HeartSheet therapy is as rigorous as promised. As more treatments emerge, officials should make sure that — fast track or not — they have a valid claim to efficacy before being sold to patients.

A therapy for heart disease could be the first iPS-cell clinical breakthrough that Japan so ardently desires. The country shouldn't sell short the promising technology or the patients who hope to benefit from it. ■

False testimony

A lie-detection system being used by Spanish police highlights concerns about algorithms.

If you live in southern Spain, last June was not a good time to lose your smartphone and, as a way of getting an insurance payout, falsely claiming that you had been mugged. Ten police forces in Murcia and Malaga had some extra help in spotting your deceit: a computer tool that analysed statements given to officers about robberies and identified the telltale signs of a lie. According to results published in the journal *Knowledge-Based Systems*, the algorithm was so good at pointing officers towards false claimants that detection of such offences in one week was an impressive 31 and 49 for the respective regions, up from an average of 3 and 12 closed cases over the entire month (L. Quijano-Sánchez *et al. Knowl.-Based Syst.* **149**, 155–168; 2018). The government in Madrid is now rolling the system out across the country, and its developers are trying to apply its machine-learning methods to help detect other types of crime.

In this case, the algorithm flagged up suspicious wording (based on a training set of statements known to be true and false), and left it up to the police to question suspects and get them to confess. A person, not a computer, made the final decision. Still, it's another example of the steady march of algorithms and artificial-intelligence (AI) systems into public life and decision-making — and that's a trend that makes some people uncomfortable.

Last week, the UK House of Commons Science and Technology Committee published a report, 'Algorithms in decision-making', that summarizes many of those anxieties, and suggests some ways to allay them. It's timely. Also last week, the UK government announced plans to make National Health Service (NHS) data available to companies and others to help build AI-based tools for diagnosing cancer. And the University College London Hospitals NHS Foundation Trust announced a partnership with the Alan Turing Institute, which works on data science and AI, to find ways of improving health care in the NHS. It aims, for example, to use data sets of previous cases of people who arrive at hospital with abdominal pain, to develop a more effective triage system.

Nature has raised concerns about the development of AI health-care algorithms before, particularly those that seek to diagnose disease (see *Nature* **555**, 285; 2018). Although they show great promise, it is crucial that they are developed with proper scrutiny and review of the evidence. That has not always been the case so far.

The UK parliamentary report also discusses a controversial and pertinent issue: how much could and should people who are affected by algorithms' decisions be told about how the software works? This 'right to explanation' is included in Europe's new data-protection laws, which came into force last week, although details on how this might change practice are unclear. At present, only France has committed to publishing the code behind algorithms used by the government. More should follow its lead: in evidence to the parliamentary inquiry, the UK government said its departments used such programmes widely; this includes HMRC, the department that calculates and collects tax.

Some witnesses to the inquiry claimed that most people would not understand an explanation of how such software works. Others said that to open the 'black box' and lay out how an algorithm works is itself a difficult problem and one compounded by trade secrets. One option, as the report details, is to offer context that helps people to understand the algorithm's workings: to tell someone who has been refused a loan, for example, that the computer helping to make the decision required them to be earning £15,000 (US$20,000) more a year.

Revealing such details does, of course, allow people to try to game the system. The Spanish police face this problem, too: in describing how their software detects fibs, they are handing advice to those who would lie to them in future about being robbed. This information is already in the public domain, so we're not breaking any confidences by repeating them here: avoid mention of the brand names of what was stolen, don't say the attacker came from behind, and make your statement as long as possible. Still, the Spanish police have an incentive to publicize their system: they hope it will act as a deterrent. In this case, *El Gran Hermano* really is watching you. ■